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STATUS OF THE EUROPEAN CORN BORER IN 1937

Division of Cereal and Forage Insects
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European Corn Borer Research

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STATUS OF THE EUROPEAN CORN BORER IN 1937 [1]

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DISTRIBUTION.-The European corn borer is now known to be distributed in the eastern counties of Wisconsin and in that portion of the Northeastern States composed of all or parts of Indiana, Michigan, Ohio, Pennsylvania, New York, and New England and extending down the Atlantic Coast to include New Jersey, southern Delaware, the Eastern Shore of Maryland and Virginia, and several counties on the Virginia mainland. While intensive scouting to determine the exact limits of the area infested by the corn borer has not been performed by the Bureau of Entomology and Plant Quarantine in recent years, information accumulated in cooperation with various States shows only a slow spread since 1932. In 1934 first records of infestation were received from Hamilton County, Ohio, in the Lake States area, and from the following counties in the Eastern States area: Cumberland in New Jersey, Sussex in Delaware, Somerset in Maryland, and Northampton in Virginia. In 1935 Brown and Calumet Counties in Wisconsin, Boone County in Indiana, and Salem County in New Jersey were recorded for the first time as being infested by the corn borer. In 1936 initial infestation was recorded from Norfolk, Princess Anne, and Elizabeth City Counties, Va., and Johnson County, Ind., and in 1937 Winnebago County, Wis., was added to the area known to be infested by the borer. Also in 1937, from scouting records provided by Mr. G. T. French, State Entomologist of Virginia, light infestations have been observed in the counties of York, Gloucester, Mathews, and Northumberland in Virginia.

ABUNDANCE IN CORN.-Comparative data on the abundance of the European corn borer in corn in 1937 in different infested sections were procured in a survey conducted from August 16 to October 1. Slightly more than one-third as extensive as in 1936, the 1937 survey involved the examination of 880 cornfields, taken at random on a county or county-group basis, within 6 counties in Michigan, 17 in Ohio, 10 in Indiana, 7 in New York, 6 in Massachusetts, 2 in Connecticut, 5 in New Jersey, 1 in Delaware, 2 in Maryland, and 2 in Virginia - a total of 58 counties.

The Conservation Department of the State of Indiana cooperated actively by surveying the three county groups (120 fields) in Indiana. Assistance was given by the Virginia Truck Experiment Station in determining that infestation by the European corn borer remained extremely light in the counties of Norfolk, Princess Anne, and Elizabeth City, on the Virginia mainland.

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[1] Extensive cooperation with the several infested States was maintained in the accumulation of the field-status data.

Thoroughly tested field methods, known to supply data adequate for comparisons between counties and county groups for 1 or more years, were employed. Generally, the counties situated in the older infested portion of the area were considered separately and in each a total of 20 fields taken at random were surveyed. In the more lightly infested sections the counties were combined in groups of from two to five and in each group a total of 30 or 40 fields taken at random were surveyed. The percentage of plant infestation was determined by a count of 100 plants in each field, and the average number of borers per infested plant was found by a dissection of 10 infested plants in each field of a county unit and of 5 infested plants in each field of a county group.

Information on the abundance of the European corn borer in corn in 1937, in comparison with that of recent years,[2] is summarized in tables 1 to 3, figures 1 and 2, and in the following discussion.

Lake States (Michigan, Indiana, Ohio, and New York).-In the surveyed portions of Michigan, Indiana, and Ohio, taken as a whole, the European corn borer was as generally distributed and as abundant in 1937 as in any previous year of record. Within the territory surveyed in these states in 1937, comprising 18 counties and 4 county groups, there were 9 counties and 3 county groups in which corn borer populations increased significantly from 1936 to 1937, and 9 counties and 1 county group in which the abundance of the insect changed slightly in the same two years. Significant decreases were absent.

A definite increase in corn borer abundance in 1937 over 1936 was shown along the southeastern edge of Michigan, where the average of 151 borers per 100 plants in 1937 exceeded the average of 68 per 100 plants in 1936. Five of the six counties surveyed in Michigan showed a significant increase in borers from 1936 to 1937 and one had a tendency toward increase. The highest population was recorded in Monroe County and the greatest percentage of increase in Macomb County. All of the 120 fields surveyed in Michigan in 1937 were infested.

Two of the county groups surveyed in Indiana showed increases in infestation in 1937 over 1936, while in the third county group the infestation remained practically unchanged during these two years. The region, as a whole, had about the same low population level in 1937 as in 1936.

In the surveyed portion of northwestern Ohio the status of the corn borer in 1937 remained about the same as in 1936. A significant increase in population of the insect in 1937 over 1936 was found in four counties and one county group in Ohio, with no appreciable change in the remaining eight counties. The most pronounced increase of the borer in Ohio occurred in the Champaign-Darke-Logan-Miami-Shelby county group, the southernmost section surveyed in 1937, where the average number of borers per 100 plants rose from 0.6 in 1936 to 18.8 in 1937, with a more generally distributed infestation in the latter than in the former year.

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[2] Records from the Insect Pest Survey Bulletin, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Vol. 15, No. 9, Supplement, 1935, and Vol. 16, No. 9, Supplement, 1936.

Table 1.-Abundance of the European corn borer in corn in the fall of 1937 as compared with 1934, 1935, and 1936.

County or County Group	Average Number of Borers per 100 Plants			
	1934	1935	1936	1937
Lake States				
Michigan				
Lenawee	13.3	56.4	53.6	147.9
Macomb	20.9	45.9	43.2	178.6
Monroe	27.6	42.9	98.0	215.9
St. Clair	11.8	57.3	69.4	157.7
Washtenaw	2.7	19.5	45.4	75.4
Wayne	7.7	7.2	98.6	131.0
District average	14.0	38.2	68.0	151.1
Ohio				
Defiance	8.1	4.8	11.0	27.5
Fulton	30.1	41.0	63.9	67.1
Hancock	25.9	38.8	96.6	66.8
Henry	10.4	44.7	74.2	66.4
Lucas	22.7	121.5	161.5	149.4
Ottawa	22.5	25.9	86.9	99.9
Paulding	3.0	42.1	10.6	31.4
Putnam	3.1	37.6	52.1	45.7
Sandusky	3.8	48.6	107.1	89.3
Seneca	16.7	27.9	31.8	101.8
Williams	2.5	9.2	15.4	33.1
Wood	47.6	91.2	138.4	96.4
Champaign-Darke-Logan-Miami-Shelby	5.0	12.9	0.6	18.8
District average	15.5	42.0	65.4	68.7
Indiana				
Adams-Blackford-Jay-Wells	0.3	2.3	0.1	4.4
Allen-DeKalb-Steuben	7.7	27.8	10.9	8.5
Huntington-Noble-Whitley	2.6	5.9	1.6	3.1
District average	3.5	12.0	4.2	5.3

Table 1.-Continued

County or County Group	Average Number of Borers per 100 Plants			
	1934	1935	1936	1937
Lake States (cont.)				
New York				
Jefferson-Oswego	41.4	44.8	34.7	21.2
Albany-Fulton-Montgomery-Schenectady-Schoharie	25.4	48.1	-	45.9
District average	33.4	46.4	-	33.5
Eastern States				
Massachusetts				
Essex	105.8	200.5	180.2	225.2
Middlesex	185.9	303.9	155.8	394.0
Franklin-Hampden-Hampshire-Worcester	40.1	20.5	216.9	72.5
District average	110.6	175.0	184.3	230.6
Connecticut				
Hartford	61.3	721.4	538.9	1077.2
New Haven	325.0	469.2	391.7	845.5
District average	193.2	595.3	465.3	961.4
New Jersey				
Monmouth	20.4	43.4	93.7	157.4
Atlantic-Burlington-Ocean	3.4	33.3	19.4	69.0
Middlesex	-	-	6.7	38.1
District average (based on first county and county group)	11.9	38.4	56.6	113.2
(based on entire region)	-	-	39.9	88.2
Delaware				
Sussex	-	-	1.1	5.9
Maryland				
Wicomico-Worcester	-	9.4	0	11.4
Virginia				
Accomac-Northampton	-	18.1	5.1	73.1

Table 2.--Summary of European corn borer abundance in corn by States and areas, 1934 - 1937.

Area and State	Number of Counties or County Groups	Average Number of Borers per 100 Plants*			
		1934	1935	1936	1937
Lake States					
Michigan	6	14.0	38.2	68.0	151.1
Ohio	13	15.5	42.0	65.4	68.7
Indiana	3	3.5	12.0	4.2	5.3
New York	1	41.4	44.8	34.7	21.2
Total or average	23	14.7	37.2	56.8	79.9
Eastern States					
Massachusetts	3	110.6	175.0	184.3	230.6
Connecticut	2	193.2	595.3	465.3	961.4
New Jersey	2	11.9	38.4	56.6	113.2
Delaware +	1	-	-	1.1	5.9
Maryland	1	-	9.4	0	11.4
Virginia	1	-	18.1	5.1	73.1
Total or average	9	-	202.2	178.0	325.0

*All averages based only on comparable counties or county groups.
+Excluded from areal average.

Table 3.-Grouping of cornfields surveyed in 1936 and 1937, in comparable counties, according to their borer populations.*

Average Number of Borers per 100 Plants	Percent of Surveyed Fields with Indicated Population			
	Lake States		Eastern States	
	1936	1937	1936	1937
0	18.0	9.4	34.8	14.8
1-25	42.0	40.2	22.4	29.3
26-50	11.6	12.7	6.6	8.6
51-100	12.9	15.3	8.6	11.4
101-200	10.4	13.4	10.3	11.4
201-300	3.1	5.3	3.4	5.5
301-400	.9	1.5	4.1	3.4
401-500	.7	1.3	1.4	2.7
501-600	.0	.5	2.4	3.1
601-700	.2	.2	1.4	.4
701-800	.2	.2	1.0	1.7
801-900			.4	.7
901-1,000			.4	.4
1,001-2,000			2.8	5.2
2,001-3,000				1.0
3,001-3,200				.4

*The percentages for the Lake States are based on 550 fields, and those for the Eastern States, on 290 fields, surveyed in each of the two years.

Although the fall survey, detailed in this discussion, showed that the status of the corn borer remained unchanged in 8 of the Ohio counties lying directly to the southwest of the western end of Lake Erie, a considerable number of cornfields, particularly in Lucas and Ottawa Counties, carried high borer populations. Damage to early sweet corn grown near Toledo, Ohio, in 1937 reached economic importance, with an average of 794 borers per 100 plants, according to a survey of 25 of the earliest fields, conducted August 5 - 13, representing a significant increase from an average of 469 borers per 100 plants found in a similar survey in that section in 1936. Comparable populations in early market sweet corn in this section in 1934 and 1935 averaged 268 and 328 borers per 100 plants, respectively.

In general, the prevailing weather of the 1937 season in the surveyed parts of Michigan, Ohio, and Indiana was considered more favorable to the European corn borer than that of any recent year. A wet spring delayed the planting of corn in many fields, however, and it is probable that the consequent lateness of part of the crop, complemented in some cases by decreased vigor of plant growth in wet soils, contributed to a lowered survival of the borer in such fields, whereas a more favorable environment for the insect in the earlier and sturdier corn was conducive to high borer concentrations. Apparently the late planting of much of the corn in 1937, together with other unfavorable factors, such as severe rain and wind storms in some sections at crucial periods of larval establishment, offset the effects of a season otherwise favorable to increased abundance of the corn borer.

In New York there occurred a decrease in corn borer abundance as compared with 1936 in the Jefferson-Oswego county group, while approximately the same numbers of borers were present in the Albany district in 1937 as found during the last survey, made in 1935.

Eastern States (Massachusetts, Connecticut, New Jersey, Delaware, Maryland, and Virginia).-Along the Atlantic coast the European corn borer increased in abundance in 1937 over 1936 in a portion of eastern Massachusetts, in central Connecticut, in southeastern New Jersey, in southern Delaware, and on the Eastern Shore of Maryland and Virginia. The only exception to an increase or tendency in that direction was in western Massachusetts, where a significant decrease in borer population in 1937 was shown by the survey.

In Middlesex County, Mass., there occurred an increase from an average of 155.8 borers per 100 plants in 1936 to 394 in 1937, while in Essex County, Mass., no significant change in borer population took place between the same two years. In the county group of Franklin-Hampden-Hampshire-Worcester, in western Massachusetts, the average population of 216.9 borers per 100 plants in 1936 declined to 72.5 in 1937.

The heaviest borer populations found in 1937, or in any other year of survey in the United States, occurred in Hartford and New Haven Counties, Conn. In the former county the average of 538.9 borers per 100 plants in 1936 doubled itself to 1,077.2 per 100 plants in 1937, and in the latter county the average of 391.7 borers per 100 plants in 1936 doubled itself to 845.5 per 100 plants in 1937. Half of the 20 cornfields surveyed in Hartford County in 1937 averaged more than 1,000 borers per 100 plants, and 7 out of the 20 fields surveyed in New Haven County had populations of this size. For the combined

counties, the proportion of fields with more than 1,000 borers per 100 plants increased from 17.5 per cent in 1936 to 42.5 per cent in 1937. The maximum number of 3,200 borers per 100 plants was found in one field in Hartford County.

In New Jersey the survey showed significant increases in corn borer abundance in 1937 over 1936 in Middlesex County and in the Atlantic-Burlington-Ocean county group, with a strong tendency toward significant increase in Monmouth County. In the last county the average number of borers per 100 plants reached 157.4, and half of the fields surveyed in it had over 100 borers per 100 plants, with 2 fields out of 20, or 10 per cent, exceeding 500 borers per 100 plants.

Corn borer abundance in Sussex County, Del., increased from an average of 1.1 borers per 100 plants in 1936 to an average of 5.9 in 1937, with infestation noted in 37 per cent of the fields surveyed in 1937 as compared with 10 per cent in 1936. The maximum population in a single field in Delaware in 1937 was 56.6 borers per 100 plants.

In the Wicomico-Worcester county group in Maryland, where no borers were found during the 1936 survey, there was an average of 11.4 borers per 100 plants in 1937, 40 per cent of the fields examined being infested. The maximum number of borers in a single field in Maryland was 135.5 per 100 plants.

Increased infestation by the European corn borer also appeared in the Accomac-Northampton county group in Virginia, where the average number of borers per 100 plants rose from 5.1 in 1936 to 73.1 in 1937, with the insect present in the latter year in all 40 fields surveyed. Over 100 borers per 100 plants were recorded for 12.5 per cent of the fields, with maximums of 424 and 372.6 borers per 100 plants in two of them.

A conclusive explanation of the general increases in corn borer abundance along the Atlantic Coast in 1937 is not offered at this time. It can be assumed with a considerable degree of certainty, however, that favorable weather conditions at propitious periods of the insect's development in the field were the influencing factors, with emphasis on the absence of drought in 1937. In Connecticut the increased corn borer infestation in 1937 over 1936 was due principally to an extremely heavy deposition of second-generation eggs, indicative of satisfactory moisture and temperature conditions in the field for the moths during oviposition. Deposition of first-generation eggs and larval establishment in both generations, near New Haven, Conn., were practically the same in 1937 as in 1936.

ABUNDANCE IN POTATOES.-Supplementing the general fall survey of corn borer populations in corn, a survey of infestation by the first generation in potatoes was conducted during the last two weeks of July 1937 on eastern Long Island, N. Y., in central Connecticut, and in west-central Massachusetts. A large part of the last two districts lies in the Connecticut River Valley. In each of the three districts 25 fields of potatoes, taken at random, were examined according to tested survey methods, and the data obtained are summarized in table 4.

Similar surveys of the infestation in potatoes had been conducted on eastern Long Island from 1932 to 1935, inclusive, and the average numbers of borers per 100 plants for those years, respectively, were determined as 22.8, 64, 48.7, and 30.1. In 1937 the average number of borers per 100 plants in the same region was 60.

Potatoes in central Connecticut and west-central Massachusetts had not been surveyed previously for corn borer infestation. In the former district the average number of borers per 100 plants in 1937 was 106.2 and in the latter, 73.5. Although the two fields with the highest borer populations (580 and 400 per 100 plants) were found in Massachusetts, there were practically twice as many fields with an average of over 100 borers per 100 plants in Connecticut as in either the Long Island or the Massachusetts district. Both on Long Island and in Connecticut 88 per cent of the fields showed infestation by the corn borer as compared with 56 per cent of the fields in Massachusetts. The maximum number of borers found in a single potato plant in 1937 was 12.

Table 4.-Summary of data on corn borer infestation in potatoes, Long Island, N. Y., Connecticut, and Massachusetts, 1937.

District	Period of Survey	Number of Fields	Average Per Cent of Plants Infested	Average Number of Borers per 100 Plants	Per Cent of Fields Infested by Borer	Per Cent of Fields with Average of Over 100 Borers per 100 Plants
Eastern Long Island, N.Y.	July 17-21	25	30.3	60.0	88.0	24.0
Central Connecticut	July 22-27	25	48.4	106.2	88.0	44.0
West-central Massachusetts	July 27-31	25	23.5	73.5	56.0	20.0

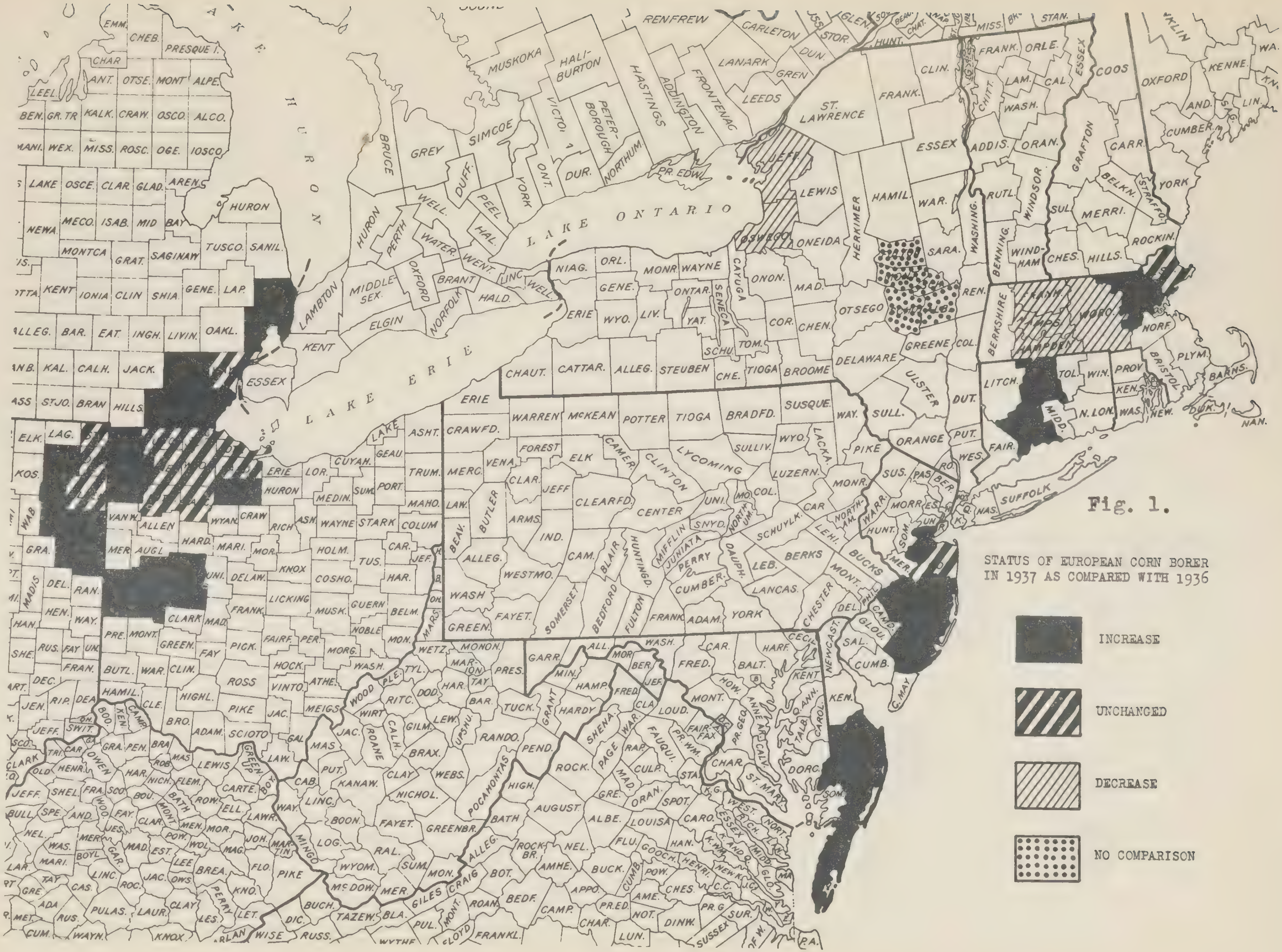

STATUS OF EUROPEAN CORN BORER
IN 1937 AS COMPARED WITH 1936
INCREASE
UNCHANGED
DECREASE
NO COMPARISON
LAKE HURON
LAKE ONTARIO
LAKE ERIE

Fig. 1.

Fig. 2.

RELATIVE ABUNDANCE OF EUROPEAN CORN BORER OVER INFESTED TERRITORY SURVEYED IN 1937

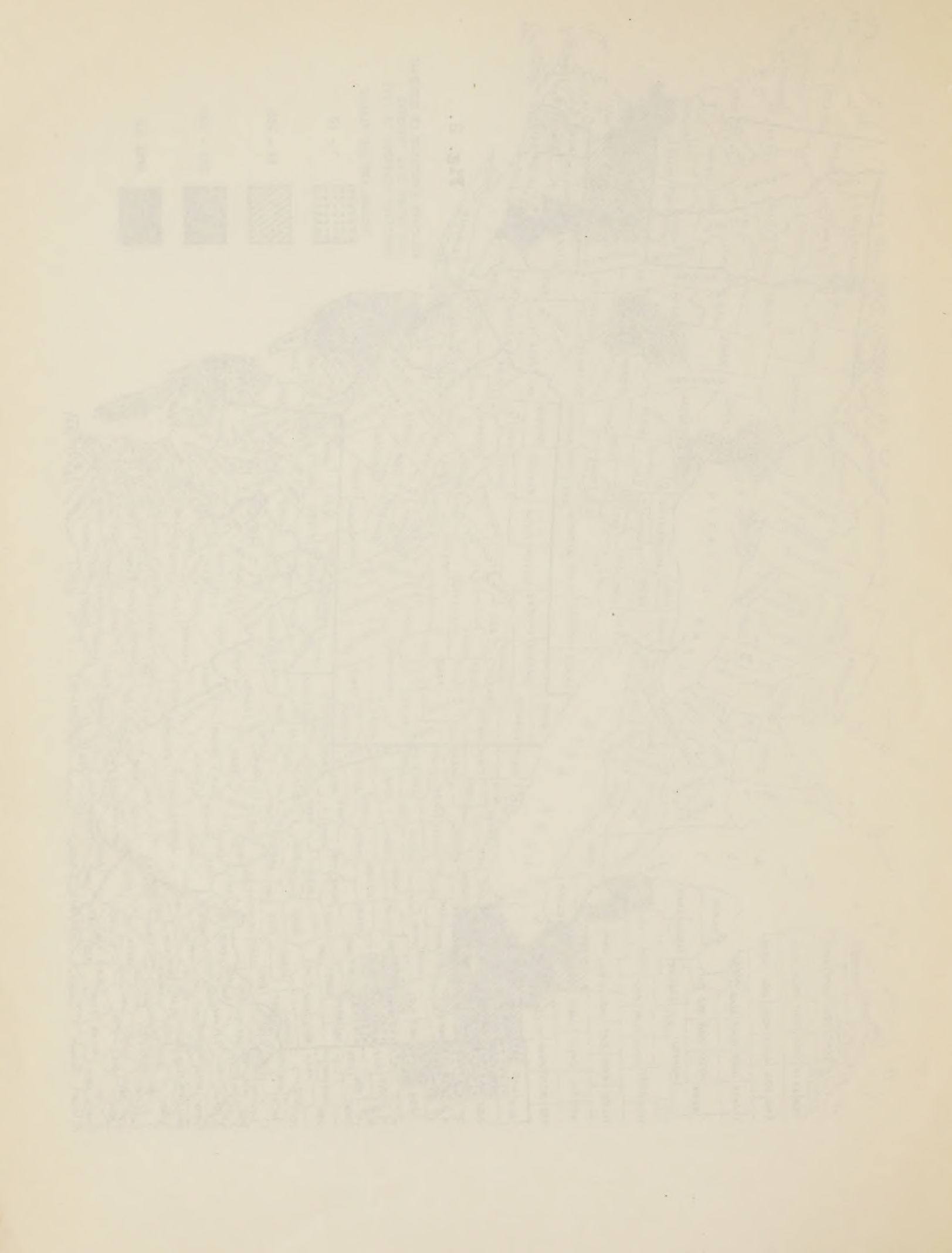
BORERS PER 100 PLANTS

0 - 10

11 - 100

101 - 500

OVER 500

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